



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Tense and plural formation in Welsh-English bilingual children with and without language impairment

Citation for published version:

Chondrogianni, V & John, N 2019, 'Tense and plural formation in Welsh-English bilingual children with and without language impairment', *International Journal of Language & Communication Disorders*, vol. 53, no. 3, pp. 495-514. <https://doi.org/10.1111/1460-6984.12363>

Digital Object Identifier (DOI):

[10.1111/1460-6984.12363](https://doi.org/10.1111/1460-6984.12363)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

International Journal of Language & Communication Disorders

Publisher Rights Statement:

This is the pre-peer reviewed version of the following article: Chondrogianni, V. and John, N. (2018), Tense and plural formation in Welsh–English bilingual children with and without language impairment. *International Journal of Language & Communication Disorders*. doi:10.1111/1460-6984.12363, which has been published in final form at <https://doi.org/10.1111/1460-6984.12363>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Self-Archiving.

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Tense and plural formation in Welsh-English bilingual children with and without language impairment

Running title: Tense and plural formation in Welsh children with SLI

Keywords: SLI, Developmental Language Disorder, past tense, plural formation, Welsh

Abstract

Background: Grammatical morphology has been shown to be problematic for children with Specific Language Impairment (SLI) or [Developmental Language Disorder \(DLD\)](#). Most research on this topic comes from widely spoken languages, such as English. Despite Welsh being the most extensively spoken language in the UK after English and Wales being the only official bilingual country in the UK, our knowledge about the morphosyntactic areas of Welsh that may pose problems for Welsh-speaking children with SLI is limited. At the moment, Welsh-speaking Speech and Language therapists (SLTs) are heavily reliant on the use of informally translated English assessments. This can inadvertently result in a failure to take aspects of Welsh morphosyntax into account [that are](#) critical for the assessment and treatment of Welsh-speaking children.

Aims: This is the first study to examine how Welsh-English bilingual children of early school age with typical development (bi-TD) and with specific language impairment (SLI) (bi-SLI) perform on production tasks targeting verbal and nominal morphology in Welsh. We targeted areas of Welsh morphosyntax that could potentially be vulnerable for Welsh-speaking children with or at risk of language impairment, such as tense marking and plural formation, and assessed their diagnostic potential.

Methods & procedures: Twenty-eight Welsh-dominant bilingual children participated in the study: 10 bi-SLI and 18 bi-TD children. They were administered three elicitation tasks targeting the production of verbal (compound and synthetic past tense) and nominal (plural) morphology in Welsh.

Outcomes & results: The bi-SLI children performed worse than their bi-TD peers across all three tasks. They produced more uninflected verbs in the elicited production

task and were less likely to be prompted to produce the synthetic past, which is a concatenating, low frequency form of the past tense. They also overregularised less in the context of plural nouns, and when they did, they opted for high frequency suffixes.

Conclusions & implications: By focussing on aspects of morphosyntactic development which are unique to Welsh, we have increased knowledge about how verbal and nominal morphology are acquired in Welsh-speaking bi-SLI and bi-TD children. The present results point towards productivity problems for Welsh-speaking bi-SLI children, who are adversely influenced by low frequency structures and fail to overregularise in the context of verbal and nominal concatenating morphology. From a clinical perspective, targeting synthetic past tense forms through a prompting task may be a promising assessment and intervention tool that future studies could explore further.

What this paper adds

- 1. What we know:** Tense and plural morphology has been documented to be differentially impaired across a number of well-studied languages. However, our knowledge regarding how these features develop in typically developing and language-impaired children speaking a minority language such as Welsh is non-existent.
- 2. What this study adds:** This is the first study to examine the acquisition of tense and plural morphology in Welsh-dominant children with typical development and/or at risk of SLI. Welsh-speaking children with SLI had pronounced problems with inflecting verbs and producing plural nouns, even when prompted. It is also the first study to investigate whether concatenating verbal (synthetic) and nominal (plural) grammatical morphology and errors associated with them as opposed to free morphology (auxiliaries in synthetic past tense forms) can help us better identify Welsh-speaking children at risk of SLI.
- 3. Clinical implications:** The production of tense and plural morphology is a challenging area of Welsh grammar for Welsh-speaking children with SLI. The opportunity to formally address the specific and unique linguistic characteristics has implications for a more rigorous assessment and successful intervention in the field of speech and language therapy in Wales. It allows a new dimension for SLTs working within the Welsh context and the provision of more equitable approach to meeting the needs of this child population.

Introduction

Past tense and plural formation in children with SLI

Grammatical morphology has been shown to be a vulnerable area for monolingual and bilingual children with Specific Language Impairment (SLI) (Mo-SLI, Bi-SLI) or with the recently coined term Developmental Language Disorder (DLD) (Bishop et al., 2017, Bishop et al., 2016),¹ speaking a number of languages (Leonard, 2014a, Paradis, 2010). Tense formation, in particular, has been documented as being especially problematic both at the level of suffixes or concatenating morphology, e.g. past tense *-ed* in English, and free morphology, e.g. auxiliaries, for children with SLI speaking a number of languages such as English (Paradis, 2016, Rice and Wexler, 1996, Pine et al., 2008), German (Clahsen et al., 1997), Dutch (Rispen and De Bree, 2014, Bol and de Jong, 1992, de Jong et al., 2013), and French (Paradis and Crago, 2001), among many others. However, the severity of the impairment differs across languages and is modulated by the availability, systematicity and transparency of morpho-phonological cues in a particular language (Leonard, 2014). This raises questions about which grammatical areas are impaired in children with SLI or DLD across different languages and how we can best identify them (Bishop et al., 2017: 1073).

In comparison to the verbal domain, nominal morphology has received less attention despite the fact that it can be problematic in typologically different languages. Studies on Mo-SLI speaking Germanic languages such as English (Oetting and Rice, 1993) and Dutch (Boerma et al., 2017; Kuipers, 2011), German (Schöler

¹ Although we fully acknowledge the introduction of the term Developmental Language Disorder (DLD) by Bishop et al., (2016, 2017) and the new dimensions that it brings to the study of language impairment in children, in the present paper, we use the term SLI and Bi-SLI as these are more well established and recognisable in the bilingual literature. Furthermore, in our study, we applied exclusion criteria, such as excluding children with ADHD or with IQ below 85, that would be included under the new DLD definition.

and Kürsten, 1995) have reported that plural formation is less problematic than tense, even though children with SLI have a depressed performance compared to their monolingual typically developing (Mo-TD) age-matched peers. [This contrasts with studies on Icelandic and Hungarian](#) (Thordardottir, 2008, Thordardottir, 2016, Lukács et al., 2013), [where Mo-SLI children either performed similarly on verbal and nominal morphemes](#) (Thordardottir, 2008) or they did not differ from their TD peers (Lukács et al., 2010; Thordardottir, 2016). [In these languages, verbal and nominal morphemes are acquired early by TD children.](#) In contrast to these studies, research on languages with more complex plural formation systems such as Semitic languages (Arabic and Hebrew) have shown pronounced problems with plural morphology for children with SLI who lag starkly behind their TD peers (Abdalla et al., 2013). This finding is less surprising if one considers that plural formation in Semitic languages is more complex than in Germanic languages, and certain plural formation rules are late acquired even by TD children (Schiff et al., 2011, Ravid and Schiff, 2009). These crosslinguistic studies show that children with SLI are less likely to fully master plural formation rules that involve the application of multiple processes (e.g. suffixation plus internal vowel change) compared to their TD peers, less likely to use the right allomorph in specific contexts or overregularise and, when they do, they overuse the most frequent suffix (Kauschke et al., 2011, Abdalla et al., 2013).

In the [only study to date on Bi-SLI children by](#) Boerma et al. (2017), Turkish-Dutch-speaking bi-SLI children differed from their bilingual TD (bi-TD) peers on the production of plural morphology and past participles, when tested between the ages of four-to-seven years, but differences between the two groups disappeared for plural nouns but not for past participles, when tested a year later.

The present study contributes to this on-going debate regarding the vulnerability of tense and plural morphemes in bilingual children with SLI within the context of a minority language such as Welsh in an attempt to identify language areas of Welsh that are impaired and could thus be targeted during assessment and intervention. Welsh belongs to the Celtic family of Indo-European languages and it is currently spoken by approximately half a million people in the UK. Wales is the only officially bilingual country in the UK. Welsh offers a compelling test case of the acquisition of tense and plural morphemes by children with SLI because these morphemes present different levels of difficulty. Welsh has concatenating morphology in both the verbal and the nominal domain and both free and concatenating morphology in past tense formation. At the same time, the acquisition pattern of these grammatical morphemes is less explored even in TD children. In the present study, we examined how Welsh-English bilingual children with or at risk of language impairment acquire tense and plural formation compared to their TD peers in the context of this minority language.

Properties of Welsh and previous studies on the acquisition of Welsh

Welsh has morphologically rich verbal and nominal paradigms. Welsh has a VSO word order, which means that the inflected verb, be it an auxiliary or a lexical verb, is placed before the subject and the object. Inflected auxiliaries, such as *bod* ‘to be’ and *gwneud* ‘to do’, which have a suppletive form (e.g. *mae* ‘is’ for third person singular present), combine with the infinitival form of lexical verbs to form compound tenses (King, 2015), either the present, as in (1a) or the past, as in (1b). In this case, the sentence structure is Aux+S+V_{INF}+O and it is known as the periphrastic form of the verb. When the auxiliary is the verb *bod* ‘to be’, an aspectual marker (ASP) in the

form of a free morpheme denoting progressivity is obligatory, as in (1a). When the inflected verb is a lexical verb, the sentence structure is VSO, as in (1c). The formation of the present relies solely on verbal compounds (see 1a), whereas the past tense can be formed by either verbal compounds with the auxiliary in the past tense, as in (1b), or with lexical verbs carrying concatenating morphology, as in (1c), also known as the synthetic form of the past.

- (1) a. Mae 'r hogyn yn gweld y clown.
 Be.PRES.3SG the boy ASP see.INF the clown²
 “The boy sees/is seeing the clown”
- b. Naeth.AUX yr hogyn gweld y clown.
 Do PAST.3SG the boy see.INF the clown
- c. Gwel-odd yr hogyn y clown.
 Saw.PAST.3SG the boy the clown.
 ‘The boy saw the clown’.

The periphrastic formation of verb tenses has been shown to be more frequent than the synthetic form, with the latter also being associated with a higher register of Welsh (King, 2015).

In the nominal domain, Welsh forms the plural using suffix addition, deletion, substitution, or suppletion. In a study on an adult corpus of Welsh, Thomas et al. (2013) reported that suffixation was the most frequent plural formation type in the data. Each suffix carries an additional syllable, resulting in further alterations to the final plural form in some instances. These additional alterations take the form of

² PRES = present; 3SG = third person singular; ASP = aspect; INF = infinitive.

mutation and other sound alterations, e.g. *botwm* (“button”) → *botymau* (“buttons”), where the vowel in the penultimate syllable undergoes a sound alteration) (Thomas et al., 2013) (Table 1). The most common plural suffixes are *-(i)au*, *-i*, *-od*, *-oedd*, *-on*, *-aid*, and *-ydd*, often used in combination with additional changes in sound quality and/or vowel alternations (Thomas et al., 2013) (see Table 1). The suffixes *-(i)au* and *-oedd* function solely as plural suffixes, whereas the other suffixes can take on other functions and meaning, and *-(i)au* was the most frequently added suffix. This is, for example, the case for the *-ydd* suffix, which adjoins to singular nouns indicating person or object (e.g. *gobennydd* “pillow”) (Thomas et al., 2013).

Turning to the acquisition of these properties, although recent studies have tried to identify different stages in the development of the Welsh (e.g. the Welsh profile LLARSP (Llawn Asesiad o Ramadeg Siaradwyr â P(h)roblemau-Revised (Ball and Thomas, 2012), their results are not accompanied by information regarding age of acquisition of the different inflectional morphemes or structures. To our knowledge, the only published empirical study on the acquisition of early verbal utterances in Welsh is that by Borsley & Jones (2001). The authors examined the production of early clauses in seven Welsh-speaking children aged between 1;6 and 2;5 years. Although no quantitative analysis was carried out, the authors reported that the earliest clausal utterances in the corpus did not have finite verbs. Finite clauses with the suppletive forms of the copula *bod* ‘to be’ were the first ones to emerge and they were produced along with non-finite clauses until the age of 2;5 years.

The acquisition of plural formation in Welsh has been experimentally studied in a large group of seven-to-eleven-year-old Welsh-speaking children with different degrees of exposure to Welsh by Thomas et al. (2013). Their sample consisted of Welsh L1-English L2 and English L1-Welsh L2 sequential bilinguals as well as of

simultaneous (2L1) Welsh-English bilinguals. Thomas et al. (2013) reported effects of age of exposure as well as of frequency of plural formation rule and suffix type on the production of Welsh plurals. The 2L1 children had overall lower accuracy than the L1-Welsh-speaking children and the L2-Welsh children were the least accurate of all other groups. Across all groups, plural formation through suffixation had the highest accuracy, and the suffix *-(i)au* was used both accurately and in overregularisation errors, reflecting its high frequency. Overall, however, the acquisition of the plural followed a protracted system and even the older Welsh L1 children did not reach ceiling accuracy (approx. 81%).

To date, there are no other studies on the acquisition of these phenomena in younger Welsh-speaking children with or without SLI and this is where we turn to next.

Theoretical accounts on verbal and nominal inflection in children with SLI

Problems with inflectional morphology in children with SLI have been addressed by both domain-specific and domain-general accounts. According the Extended Optional Infinitive (EOI) hypothesis (Wexler, 1998, Rice and Wexler, 1996), a domain-specific account, children's grammars have an incomplete specification of tense marking due to a maturational constraint (Wexler, 1998). This maturational constraint is operative in both typically developing children and children with SLI and gives rise to optionality in the production of tense morphemes. This maturational constraint disappears early in typical development, for example, by the age of five years in TD English-speaking children, but remains operative in children with SLI for longer. As a result, children with SLI optionally produce tense morphemes for a longer period than their TD peers (Rice et al., 1998). The EOI account postulates specific problems with

finite (tense) morphology, but not with non-finite morphology such as plural morphemes (Oetting and Rice, 1993).

The Surface Account (SA) (Montgomery and Leonard, 1998, Leonard, 1995, Leonard, 2014a), a domain-general account, postulates that children with SLI, who have been shown to have limited processing abilities (Leonard et al., 2007), will have difficulty perceiving inflectional morphemes with short duration and low phonetic salience. The combination of low phonetic salience and grammatical information on grammatical morphemes impacts on the language impaired children's ability to adequately process them and subsequently, efficiently integrate them into fully-fledged inflectional paradigms. This account predicts that grammatical morphemes in the form of (non-final) weak syllables are going to be more problematic than word-final syllabic suffixes due to salience. At the same time, the semantic transparency and systematicity of the inflectional paradigm may affect performance in that a grammatical morpheme which is semantically transparent and appears systematically in specific contexts will be less problematic in one language than in another. In the acquisition of Welsh, that would be the case for the plural suffixes *-(i)au* and *-oedd* that unambiguously mark the plural. Crosslinguistically, grammatical morphemes that are transparent and systematic tend to be acquired earlier by TD children and are less problematic for children with SLI (see Leonard, 2014 for an overview).

The well-documented processing limitations of children with SLI and their impact on their ability to efficiently “intake” the linguistic material from the input, and thus establish linguistic representations (Leonard et al., 2007), have been explored in the acquisition of morphosyntax in children with SLI (Lukacs et al., 2013, Thordardottir, 2015, Orgassa and Weerman, 2008, Christensen and Hansson, 2012), and have been integrated within usage-based approaches to language development

and impairment. For usage-based accounts of typical language development, morphophonology and (type) frequency affect children's productivity and ability to form morphological structures or *schemata* (Bybee, 2009). *Schematisation* is the formation of emergent morphological structure using analogy entrenched by the frequency of a particular schema and by type frequency. For example, a high type frequency schema, such as the formation of past tense by adding the suffix /d/ in English, is highly productive. The greater the variability of the schema, the more productive the schema will be, and it will more likely to lead to overapplications of the schema (Blom & Paradis, 2013). This account explains the overregularisations made with irregular past tense verbs in English-speaking TD children as overapplications of the regular past tense suffixation rule. The predictions of the usage-based account have been successfully applied to both monolingual (Marchman et al., 1999, Marchman et al., 2004, Christensen and Hansson, 2012) and bilingual children with SLI (Blom & Paradis, 2013) in the acquisition of tense. Input properties should influence acquisition patterns and rates for both typically developing (Thordardottir, 2015) and language impaired (Leonard, 2007) children. The key difference between these groups lies in how effectively they deal with the input. Limitations in processing input in bilingual children with SLI could impede the development and productivity of schemas (Blom & Paradis, 2013) similarly to what has been found for monolingual children with SLI (Marchman et al., 1997). In the context of past tense in bi-SLI children, these predictions were born out in the Blom & Paradis (2013) study both in terms of accuracy and error patterns. Children with SLI were more affected by frequency than their TD peers and performed more poorly on low frequency schemas, were less productive and less likely to overregularise, confirming thus previous findings on the acquisition of tense morphology in

monolingual English-speaking children with SLI (Marchman et al., 1997). In the present paper, we extend the predictions of these accounts to the acquisition of the nominal and verbal morphology in Welsh-English bi-SLI children by examining both accuracy and errors types.

Diagnostic potential of morphology in children with SLI

Despite its central role within theoretical frameworks, the diagnostic potential of grammatical morphology has either been less investigated in languages other than English, [with the exception of a handful of studies](#) (Bortolini et al., 2006b, Christensen and Hansson, 2012, Thordardottir, 2016), or its diagnostic validity has been contested, with studies showing that group differences between the typically developing and the language impaired children on a particular grammatical morpheme do not necessarily entail that the morpheme can serve as a reliable diagnostic measure, especially if there is group overlap (Thordardottir, 2016, Bortolini et al., 2006a). Diagnostic accuracy is traditionally measured through sensitivity and specificity (Plante and Vance, 1994). Sensitivity refers to the ability of the clinical test to accurately identify children with language impairment, whereas specificity shows whether a measure accurately classifies children with typical development. In the study on the acquisition of Icelandic, a highly inflected language, by 4 to 14-year-old monolingual TD and SLI children, Thordardottir (2016) showed that accuracy on grammatical morphology (verbal and nominal) cannot serve as a valid diagnostic marker for Icelandic-speaking children at any age, as there was overlap between the two groups across all ages, and sensitivity and specificity rates were unreliable. This was also the case for error rates, as both groups made grammatical errors especially at a younger age and the overlap between the TD and

the SLI children persisted even in older age groups (Thordardottir, 2016: 95). Apart from error rates, the diagnostic potential of error patterns between TD children and children with SLI has also been less explored (Christensen and Hansson, 2012), although numerous studies have shown productivity problems in children with SLI for both tense (Rispen and De Bree, 2014, Boerma et al., 2017, Marchman et al., 1999, Blom and Paradis, 2013) and plural morphology (Boerma et al., 2017). In a study on the production of plural nouns and past participles in Dutch-speaking monolingual and bilingual children with SLI tested when the children were between four-to-seven years old (Wave 1) and one year later (Wave 2), Boerma et al. (2017) showed that suffix omission in plurals and past participles could reliably differentiate between the two groups at Wave 1, although differences in error patterns disappeared in Wave 2. In the present study, we also examined the diagnostic potential of prominent error types that the SLI children make.

Present study

Given the absence of previous studies examining the development of verbal and nominal morphology in Welsh-English bilingual children of early school age, the purpose of this study was twofold. First, we wanted to assess the morphosyntactic abilities of Welsh-speaking children with typical development upon school entry, and second, we wanted to investigate structures that could potentially be problematic for age-matched children with or at risk of language impairment. These structures were the synthetic and the periphrastic past tense as well as the formation of plural nouns. More specifically, the research questions that we asked were the following:

- (i) Do Welsh-English early school-aged bi-SLI children differ from their bi-TD age-matched counterparts in the production of *tense* morphemes in terms of *accuracy* and *error* patterns,
- (ii) Do the two groups differ in the production of *plural nouns* in terms of *accuracy* and *error* patterns.
- (iii) What is the diagnostic potential of concatenating (synthetic past tense and plural formation) and free (periphrastic past tense) in Welsh-speaking children with SLI?

Method

Participants

Twenty-eight (eighteen boys, ten girls) four- to six-year old children (mean age: 65.1 months, range: 49-82 months, SD: 9.7) participated in the study. Children were attending Welsh-medium schools at the time of testing, from Reception to Year 2. All schools were located in Bangor or within a 20-mile radius of the Bangor area in North Wales. This is the most Welsh dominant area in the UK, where approx. 60% of the population is bilingual. Welsh-medium schools are bilingual schools where systematic instruction in English starts in Year 3. This means that none of the children had systematic teaching of English at the time of testing although English was spoken in the school setting by teachers and pupils. A battery of standardised and non-standardised tasks was administered in both languages to measure children's language abilities in both languages (see section *Background measures*), and a language background questionnaire completed by parents was used to assess children's language history and experience (Tuller, 2015). Through the parental report, we gathered background information about the child's quantity and quality of exposure to

the two languages, family history as well as aspects of language development and timeline of developmental milestones. We also sought teachers' evaluation of the language abilities of the children. For the bi-TD group, parents reported no history of language impairment or language delay and for none of the bi-TD children was there reported teacher/parent concern about their language development. Bi-SLI children were identified as being with or at risk of SLI based on: (i) a formal diagnosis by a professional SLT; seven children were diagnosed as having SLI and were attending special classes at the time of testing, (ii) a parent/teacher reported history of SLI (all children included in the bi-SLI group were reported to be late talkers), and/or there were concerns expressed by the parents or a professional school teacher about the child's language development, including speaking and understanding, and (iii) low language abilities across at least two language domains (phonology, vocabulary, expressive and receptive grammar) in both languages (L1/Welsh and L2/English) using the definition of bi-SLI as low language abilities across the two languages, not just one (Hakansson et al., 2003, Armon-Lotem and Meir, 2016). Given that the tasks that we administered, and particularly the novel Welsh baseline tasks, were not standardised with this bilingual population, we computed the group mean after collapsing the raw scores from both populations and derived individual z-scores on the basis of this calculation. Cut-off point for inclusion in the group with or at risk of SLI was set at -1.25 SD based on bilingual group norms. This resulted in ten (eight boys, two girls) children being included in the bi-SLI group (including the seven children with the formal diagnosis) and 18 children considered as typically developing (ten boys, nine girls). Children were matched on age by closely selecting TD children that were up to three months within the age of individual SLI children. All children also scored within the norms on the non-verbal IQ test, showed no

significant cognitive, behavioural, neurological, or oral–motor difficulties; and had hearing abilities within the normal limits. The biodata of the children in the final sample and their performance across the different tasks across the two languages are presented in Table 2.

Materials

Background assessments

Across the two languages, we targeted the same language areas to the degree that this was possible given the currently available assessments. *Although the language areas we targeted were broadly similar, they nonetheless differed in some aspects because we had to rely on the assessments that were currently available in each language.* We also used the raw scores in all analyses for the standardised and the non-standardised tasks, since children were matched on age.

Phonological working memory. English. We assessed children’s phonological working memory abilities using the Children’s nonword repetition task (CNRep, (Gathercole et al., 1994). This test consists of 40 nonwords ranging in length from two to five syllables. The nonwords contain diphthongs and consonant clusters are found both in word initial, medial and final position. The words contain common English derivational morphemes, and in that way, they resemble real English words.

Phonological development. Welsh. We assessed children’s *ability to repeat real words containing late-acquired, complex phonemes* by adapting the CWLWM (Rees and Trythall, 1995), a widely-used phonological development task for Welsh by selecting those items that contained consonant clusters in a sentence initial, medial or final position and from two to four syllables in length. Consonant clusters have been

found to be challenging for children with SLI and to successfully discriminate between TD and SLI children (Marshall and van der Lely, 2007). The focus on these properties in the revised task shortened its duration and it allowed us to target problematic areas for SLI. The items in the revised task were reduced from 49 to 28. In both tests, correct repetitions were scored 1 and incorrect ones were scored 0.

Vocabulary. *English.* Children's receptive vocabulary abilities in English were assessed with the British Picture Vocabulary Scale 3rd edition (BPVSI) (Dunn et al., 2009). In this task, children are presented with a four-picture panel, and are asked to point to the picture that matches the word uttered by the experimenter. This test has been standardised with monolingual English-speaking children.

Welsh. To assess vocabulary abilities in Welsh, we used the naming component of the CWLWM (Rees and Trythall, 1995), where the child is asked to name single objects presenting on a picture panel. There are 28 items in this task (Table 2).

Morphosyntax. *English.* To assess children's morphosyntactic abilities in English we used the *Concepts and Following Directions (CFD)*, *Sentence Structure (SS)* and the *Recalling Sentences (RS)* component from the Clinical Evaluation for Language Fundamentals-Preschool 2 (CELF-Preschool 2) (Semel et al., 2004). We followed the scoring procedures in the CELF manual.

Welsh. Given the lack (standardized) tasks to assess Welsh morphosyntax, we developed two tasks similar to the *Concepts and Following Directions* and the *Sentence Structure* components from the CELF-Preschool 2 to target specific structures in Welsh, such as VSO sentences, verbal compounds, prepositions, pronouns, relative clauses, present and past tense. This task consisted of 24 items. We

further developed a *Sentence Repetition* task that targeted verbal and nominal inflections as well as complex structures in Welsh to assess areas of Welsh grammar that may be problematic for the Welsh-speaking children (Chondrogianni et al., 2013). This novel sentence repetition task was developed within the European COST-Action IS0804 ‘Language Impairment in a Multilingual Society: Linguistic aspects and the road to assessment’ following (Marinis and Armon-Lotem, 2015) and targeted overall seven structures relevant for Welsh (VSO sentences, subject-verb agreement, prepositions, possessives, tense, relative clauses, subject and object *wh*-questions). There were six items per structure resulting in 42 items in total. For the Welsh sentence repetition task, we followed the scoring protocol from the CELF but instead of adding up the scores per item we averaged it across items (see Table 2). This was done to allow for comparability of the scoring procedure followed by other languages within the COST Action.

Non-verbal abilities. Children’s non-verbal cognitive abilities were tested using the Coloured Progressive Matrices (Raven, 2003).

Background questionnaire. To assess children’s family history, exposure and language use, we administered the short version of the Parents of Bilingual Children Questionnaire (PABIQ) (Tuller, 2015) that was developed within COST Action IS0804 ‘Language Impairment in a Multilingual Society: Linguistic aspects and the road to assessment’. The questionnaire elicited information about the child’s quantity of exposure to the two languages, developmental milestones and (family) history of learning and language disorders. We also measured children’s input quality or richness through the frequency of book-reading activities, singing songs, and

What did.AUX.PAST.3SG she do yesterday?

Child (expected response):

a. periphrastic past: Nath hi llyfu yr hufen iâ

Do.AUX.PAST.3SG she lick.INF DET ice-cream

b. synthetic past: Llyf-odd hi yr hufen iâ.

Lick.PAST.3SG she DET ice cream.

‘She licked the ice cream’.

In this task, children could respond with the periphrastic, as in (2a) or with the synthetic form of the verb, as in (2b). This task would allow us to establish which form of the past tense naturally occurs in children’s speech at this age. Given that the periphrastic past has been reported to be more frequently used in colloquial speech than the synthetic past (King, 2015), we expected children to reflect this frequency pattern. There were ten items in this task, all transitive verbs, such as *darllen* ‘to read’, *gwisgo* ‘to wear’, *tynnu llun* ‘to photograph’, *sychu* ‘to wipe’, *golchi* ‘to wash’, *cicio* ‘to kick’, *tynnu* ‘to pull’, *cribo* ‘to comb’, *chwarae* ‘to play’ and *paentio* ‘to paint’.

Sentence completion (prompting) task. To elicit the less frequent synthetic past form of the verb, we developed a sentence completion task. In this task, children would see an animal performing an action and were prompted with a synthetic past tense form of the verb describing the action. Then, they were shown a different animal performing a different action and were asked to form a sentence with another verb in the past, as in (3).

- (3) Experimenter: Ddoe, *llyf-odd* y fuwch yr hufen ia a ddoe
 Experimenter: Yesterday, *licked* the cow the ice cream and yesterday
 Child (expected response): *yf-odd* y morlo y sudd
 Child (expected response): *drank* the seal the juice.
 “Yesterday the cow licked the ice cream and yesterday the seal drank the juice’

There were ten items in total all containing high frequency transitive verbs such as *bwyta* ‘to eat’, *ysgrifennu* ‘to write’, *cicio* ‘to kick’, *cusanu* ‘to kiss’, *siasio* ‘to chase’, *pwshio* ‘to push’, *golchi* ‘to wash’, *brwsio* ‘to brush’, *paentio* ‘to paint’, and *sychu* ‘to dry’.

Plurals

Elicited production task. We elicited plural formation in Welsh by adapting the task by Thomas et al. (2013). In this task, participants were presented with a picture depicting an object and were prompted to produce the same noun describing the object in the plural, as in (4).

- (4) Dyma afal. Dyma lot o *afal-au*.
 Here apple.SG. Here lot of apples.PL.
 ‘Here’s an apple. Here’s a lot of apples’

In this task, we targeted a [subset of the plural formation](#) classes of the Welsh plural system assessed in Thomas et al. (2013). We further adapted the task by balancing the number of items across the different conditions. More specifically, we targeted classes

1-4 and 6 mentioned in Table 1. There were ten items for classes 1, 2 and 6 and eight items in classes 3 and 4, resulting in 46 items in total (see the Appendix for a full list of nouns in the plural task).

Data coding and scoring

Tense. Across the two tasks, all responses containing a verb in the past tense either using the verb compound, as in (1b and 2a) or the synthetic past, as in (1c & 2b) were counted as correct. There were also coded separately as synthetic, periphrastic-*bod* and periphrastic-*gwneud*. Erroneous responses included the following types of errors: (i) use of the present, as in (1) above, (ii) VSO responses, which involved a bare lexical verb, as in (5), (iii) SVO responses, which involved an infinitival form of the lexical verb; this could also be considered instances of auxiliary omission, (iv) aspect omission, where the aspectual marker was dropped in the context of the *bod* ‘to be’ auxiliary, (v) fragmented responses, where the verb was missing as in (8), and (vi) no responses.

- (5) Gweld yr hogyn yr clown. [VSO]
 See.INF. DET boy DET clown.
- (6) Yr hogyn gweld yr clown. [SVO]
 DET boy see.INF. DET clown.
- (7) Roedd yr hogyn *(yn) gweld y clown.[aspect omission]
 Be.AUX.3SG.PAST. DET boy ASP see.INF DET clown.
 ‘The boy was seeing/saw the clown’.
- (8) Ceffyl a ci. [fragment]
 ‘Horse and dog.

The sentence completion task also gave rise to word order errors between the auxiliary and the lexical verb, where the uninflected verb was placed in sentence initial position followed by the inflected auxiliary *gwneud* ‘to do’ in the past, as in (9).

(9) cicio nath y ceffyl at hipo. [word order error]
Kick.INF Do.PAST the horse to hippo.

Plural formation task. All target plural forms were calculated as correct, whereas the following response patterns were coded as errors: (i) production of the singular, e.g. *cath* instead of *cath-od*, (ii) wrong suffixation, e.g. *cath-au* instead of *cath-od*, (iii) Welsh noun with the English plural suffix *-s*, e.g. *ci-s* instead *cŵn*, (iv) production of an English noun in the plural, e.g. *cats*, (v) production of an English noun in the singular, e.g. *cat*, and (vii) no response. Proportion correct and individual error types were calculated out of all response types, correct and non-target-like, as the denominator.

Procedure

Children participated in four sessions, two in each language and were tested in a quiet room in their schools or homes. All children were tested by a bilingual Welsh-English research assistant, who was an experienced SLT.

Predictions of the present study

According to the EOI account, children with SLI are expected to have pronounced problems with tense marking but not with plural formation. The SA, on the other hand

would predict that phonetic salience will impact on the language-impaired children's ability to produce grammatical morphemes correctly and that (non-final) weak syllables will have lower accuracy than final syllabic inflections. In the context of the present study, children with SLI were expected to have lower accuracy with auxiliaries than with synthetic past tense forms, as auxiliaries constitute non-final weak forms, whereas synthetic forms require the addition of a syllabic form to the coda. At the same time, plural morphemes are expected to be less problematic since they all involve salient syllabic inflections. However, if semantic transparency overrides phonetic salience, then morphemes that are semantically more transparent and only denote plurality in Welsh (*-(i)au* and *-oedd*), will have higher accuracy than morphemes that are not semantically transparent.

Finally, turning to usage-based accounts of language impairment (Blom & Paradis, 2013; Marchman et al., 1999), the frequency and morphophonology of a particular schema would affect the performance of the children with SLI. In the context of the present study, the formation of the synthetic past tense in Welsh is a schema with low frequency, whereas the compound schema in the form of *Aux+V_{INF}* is the most frequent one. Children with SLI are thus expected to perform better on compound forms compared to synthetic past tense forms. With respect to plural formation, children with SLI are expected to perform better on the most frequent schema, that is the schema involving suffixation. At the same time, the most frequent suffix, i.e. *-iau* should influence performance both in terms of accuracy and overregularisations. Additionally, if children with SLI have productivity problems as previously suggested (Marchman et al., 1999, Blom and Paradis, 2013), they are expected to omit more inflectional morphemes, to overregularise less than their TD peers and their overregularisations to be influenced by type frequency.

Results

Tense

Elicited production task

Figure 1 presents children's licit (tensed) responses on the free elicitation task. A one-way ANOVA revealed a main effect of Group ($F(1,26)=4.82, p=.033, \eta^2=.17$). Subsequently, we focused on the type of accurate responses that the children produced. These involved the production of the synthetic or the periphrastic past, either with the *bod* or the *gwneud* auxiliaries (Figure 2). Sphericity was not met, for that reason the results from the Greenhouse-Geisser test are reported. A repeated-measures ANOVA with Tense type (synthetic, *bod*+V, *gwneud*+V) as the within participants factor and Group (bi-TD, bi-SLI) revealed a main effect of Tense ($F(2,50)=6.44, p=.007, \eta^2=.21$), a main effect of Group ($F(1,26)=4.82, p=.033, \eta^2=.17$), and no interaction between Group and Tense Type, suggesting that the two groups produced similar types of past tense forms in this task. Pairwise comparisons with Bonferroni correction revealed that the children produced the periphrastic form of *bod*+V more than the synthetic form of the verb ($p=.001$).

INSERT FIGURES 1 & 2 HERE

Sentence completion (prompting) task

Figure 3 presents the children's licit (tensed) responses on the free elicitation task. A one-way ANOVA revealed a significant difference between the two groups ($F(1,26)=18.41, p=.000, \eta^2=.42$). Subsequently, we focused on the type of licit responses that the children produced. These involved the production of the synthetic

or the periphrastic past, either with the *bod* ‘to be’ or the *gwneud* ‘to do’ auxiliaries (Figure 4). A repeated-measures ANOVA with Tense type (synthetic, *bod*+V, *gwneud*+V) as the within participants factor and Group (bi-TD, bi-SLI) revealed a main effect of Tense ($F(2,50)=16, p=.000, \eta^2=.39$), a main effect of Group ($F(1,26)=17.82, p=.000, \eta^2=.42$) and an interaction between Tense and Group ($F(2,50)=22.83, p=.000, \eta^2=.48$). To unpack the interaction, we ran repeated-measures ANOVAs for each group separately. For the bi-TD children, there was a main effect of Tense type ($F(2,32)=52.75, p=.000, \eta^2=.78$), with bi-TD children producing significantly more synthetic past tense forms compared to periphrastic verb forms (synthetic vs. *bod*+V and *gwneud*+V: $p<.001$). The two periphrastic forms did not differ from each other ($p>.8$). For the bi-SLI children, there was no difference between the different types of tense forms ($F(2,18)=8.45, p=.45, \eta^2=.09$). Between-group comparisons showed that the bi-TD children differed from the bi-SLI children on the production of synthetic forms ($p<.001$) but not on the periphrastic forms ($p<.2$).

INSERT FIGURES 3 & 4 HERE

Error types

Figures 5 and 6 show children’s error types on the free elicitation and the sentence completion tasks respectively. For the free elicitation task, a repeated-measures ANOVA with Error type (present, SVO, VSO, aspect omission, fragment) as the within subjects factor and Group as the between subjects factor revealed a main effect of Group ($F(1,26)=17.13, p=.033, \eta^2=.17$) but no other main effects or interactions. The main difference between the two groups was in the production of present forms

that they produced ($p=.02$), although this did not survive Bonferroni correction for multiple comparisons ($.05/6=.008$).

In the sentence completion (prompting) task, there was a main effect of Error Type ($F(5,130)=6.68, p=.002, \eta^2=.21$), a main effect of Group ($F(1,26)=17.85, p=.000, \eta^2=.42$) and no interaction between Error Type and Group. Pairwise tests with Bonferroni correction revealed that the predominant error type was VSO structures, that differed significantly from word order errors ($p=.005$), fragments ($p=.004$) and no responses ($p=.004$), but not from SVO errors ($p=.072$) and present tense ($p=.1$). The bi-SLI children produced more SVO ($p=.001$), VSO ($p=.03$) and present ($p=.02$) errors than their bi-TD peers, but only SVO errors survived correction for multiple comparisons ($.05/6=.008$).

INSERT FIGURES 5 & 6 HERE

Plural formation. Accuracy. In the plural task, the bi-SLI children had an overall proportion accuracy of .12 (SD:.06, range:.02-.22) and the bi-TD children an accuracy of .36 (SD:.23, range:.04-.89), which gave rise to a significant difference between the two groups ($F(1,26)=9.75, p=.000, \eta^2=.28$).

Figure 7 presents children's accuracy on the plural task on the five different plural formation contexts.

INSERT FIGURE 7 HERE

To ascertain whether there was an effect of plural **form** and group, we ran a repeated-measures ANOVA with Context as the within-participants factor and Group as the between participants factor. Results revealed a main effect of Group ($F(1,26)=9.5$,

$p=.005, \eta^2=.28$), but no main effect of Context ($F(4,104)=2.32, p=.09, \eta^2=.09$) and no interaction between Group and Context ($F(1,25)=.77, p=.51, \eta^2=.03$).

Error types. Subsequently, we focused on the types of errors produced by the children. These involved production of the singular, wrong suffixation, English singular nouns, English nouns with Welsh suffixation and other responses. Figure 8 presents the proportion of different error types.

INSERT FIGURE 8 HERE

A repeated-measures ANOVA with Error type as the within participants factor and Group as the between participants factor revealed a main effect of Error type ($F(4,104)=41.05, p=.000, \eta^2=.62$), a main effect of Group ($F(1,26)=21.72, p=.000, \eta^2=.47$) and an interaction between Error type and Group ($F(4,104)=13.20, p=.000, \eta^2=.35$). To unpack the interaction, we ran repeater measures ANOVAs for each group separately.

For both groups there was a main effect of Error (bi-SLI: $F(4,40)=33.9, p=.000, \eta^2=.79$; Bi-TD: $F(4,64)=7.52, p=.003, \eta^2=.32$). For the bi-SLI children, pairwise comparisons with Bonferroni correction showed that the predominant error type was the production of singular nouns, which differed significantly from all other error types ($p=.000$ from all other suffixes apart from wrong suffixation, where $p=.02$). The other error types did not differ from each other.

For the bi-TD children, the production of singular nouns was also the predominant error type that differed from all other errors (vs. English singular: $p=.002$; English plural: $p=.016$; other $p=.003$), but they did not differ from errors of

erroneous suffixation ($p=.1$). Focusing on the two predominant error types, namely singular nouns and erroneous suffixation, pairwise comparisons with Bonferroni correction revealed a significant difference between the bi-SLI and the bi-TD groups on both error types (singular: $p=.000$; wrong suffixation: $p=.018$).

A final qualitative analysis examined the types of suffixes that the children produced when not producing the target suffix. The bi-SLI children made overall 35 suffixation errors all of which involved the oversuppliance of the most frequent $-(i)au$ suffix across the different plural formation contexts. The bi-TD made 126 suffixation errors. Out of these errors, 69 errors involved oversuppliance of the $-(i)au$ suffix (54.8%), whereas the other overregularisation errors involved the $-(i)aid$ (22 items), $-od$ (18 items), $-oedd$ (7 items), $-i$ (11 items) and $-(i)on$ (9 items) suffixes.

Diagnostic validity of the Welsh tense and plural morphology

We investigated the diagnostic accuracy of the three grammatical morphology tasks by running three separate analyses: a sensitivity and specificity analysis, a ROC curve analysis and a likelihood ratio analysis (Thordardottir et al., 2011, Armon-Lotem and Meir, 2016). Sensitivity and specificity values between 80% and 89% are considered fair, while rates above 90% are good (Plante and Vance, 1994). Optimal cut-off values that best discriminate between individuals with and without a disorder can also be determined using receiver operating characteristic (ROC) curve analysis (Dunn, 2014). In this analysis, the predictive accuracy of a test is measured by the area under the curve (AUC). The AUC value represents the overall accuracy of a test: an area of 1 indicates a perfect test; an area of 0.90–1 denotes excellent accuracy; an area of 0.80–0.90 good accuracy; an area of 0.70–0.80 fair accuracy; an area of 0.60–0.70 poor accuracy; and an area below 0.60 indicates a worthless test. Likelihood ratios

were also used to evaluate the diagnostic utility of the instruments. When the outcome is binary, likelihood ratios can be calculated from the sensitivity and specificity values. A positive likelihood ratio ($LR+ = [\text{sensitivity}/(1 - \text{specificity})]$) indicates how many more times scores below the cut-off point are likely to occur in individuals with a disorder than in individuals without a disorder, whereas a negative likelihood ratio ($LR- = [(1 - \text{sensitivity})/\text{specificity}]$) indicates the likelihood of individuals not having the disorder rather than having it (Deeks and Altman, 2004).

Prior to running the diagnostic accuracy analyses, we visually inspected the overlap between the two groups in their accuracy on the three morphemes and across the different ages using scatterplots, as shown in Figures 9-11. Note that the cut-off scores in each scatterplot refer to the optimal cut-off score derived by the ROC curve analysis.

INSERT FIGURES 9, 10 & 11 HERE

In the production of the periphrastic past tense (Figure 9), the overall accuracy of the two groups was high and there was overlap in their performance, especially as the children grew older. The two groups seemed to be better differentiated in the production of the synthetic past (Figure 10). This task revealed that children with an accuracy score of 35% and below can be classified as SLI. The production of the plural morphology elicited quite low accuracy scores and a certain degree of overlap. However, only for the TD children showed improved accuracy on plural morphology with age but not the children with or at risk of SLI, as Figure 11 shows.

Figure 12 shows the output of the ROC curve analysis and Table 3 presents the diagnostic accuracy of the three tasks following the ROC curve analysis, the

sensitivity and specificity rates using binary logistic regression, as well as the likelihood ratio analysis.³

INSERT FIGURE 12 & TABLE 3 HERE

When considering accuracy only on the periphrastic forms of the past tense (Figure 2), the diagnostic accuracy of the measure ranged from borderline fair/poor, indicated by the ROC curve analysis, to worthless, as indicated by its sensitivity and likelihood ratio values. When accuracy on the task was measured to include the synthetic past (Figures 1 & 2), its diagnostic accuracy improved across all three measures, which suggests that the accuracy of the task may be driven by the children's performance on the synthetic past. This was confirmed by the diagnostic values for the accuracy on the synthetic past tense (Figure 4) and the sentence completion (prompting) task (Figure 3). The AUC of the task was excellent, and it had good sensitivity and specificity. Similar values were obtained for the plural task (Table 3). Interestingly, children's production of singular nouns in the plural task had the best diagnostic value, confirming that error types can help us distinguish between clinical and typical groups.

INSERT TABLE 4 HERE

The poor diagnostic value of the periphrastic past tense in Welsh-speaking children with SLI was confirmed when we examined whether the combination of the three tasks would lead to an increase in the diagnostic accuracy of the battery (Table 4).

³ Note that the curve for the production of singular nouns is not presented in the ROC curve figure, as higher values on this measure would indicate clinical status, whereas all the other measures in the analysis would indicate the opposite.

Binary logistic regression revealed that the full model with all three predictors was statistically significant from the intercept only model ($\chi^2(3, N = 28) = 26.8, p < .001$, Nagelkerke $R^2 = .86$). Model reduction resulted in the exclusion of the periphrastic past tense as one of the predictors. Model fit did not decrease ($\Delta\chi^2(1, N = 28) = .12, p = .92$) and this optimal model remained significant ($\chi^2(2, N = 28) = 426.04, p < .001$, Nagelkerke $R^2 = .85$).

Discussion

The present study investigated the production of verbal and nominal morphology in Welsh-dominant bilingual children with typical development and with or at risk of language impairment. Given the paucity of morphosyntactic studies on Welsh-speaking children and with this being the first study to examine the language abilities of early school-age Welsh-speaking children with SLI, the purpose of this study was threefold: (i) to examine the production of Welsh past tense and plural formation in Welsh-English Bi-TD children, (ii) to examine whether or not these Welsh structures are problematic for Welsh-English bi-SLI children, and (iii) to establish the diagnostic potential of these grammatical measures in Welsh.

To achieve these two goals, we assessed the language development of early school-aged bi-TD and bi-SLI children using a series of novel tasks targeting specific areas of Welsh morphosyntax. The development of language-specific tasks is important as translation of language tests assumes that language development in other languages follows the same developmental trajectory in the language under investigation. Additionally, translations may miss important morphosyntactic forms in the target language that potentially differentiate performance of children with and without SLI (Bedore and Peña, 2008). More specifically, we asked the following

research questions: (i) do Welsh-English early school-aged bi-SLI children differ from bi-TD children in the production of *tense* morphemes in terms of *accuracy* and *error* patterns, and (ii) do the bi-SLI children differ from bi-TD children in the production of *plural nouns* in terms of *accuracy* and *error* patterns. Finally, we examined the diagnostic accuracy of these structures for Welsh-speaking children with SLI compared to their TD peers.

Tense production in Welsh-speaking children

The present study examined two forms of past tense: the synthetic and the periphrastic. The synthetic form of the past tense in Welsh consists of a lexical verb carrying concatenating morphology marked for person and number; the periphrastic form is a verbal compound consisting of an inflected auxiliary and the infinitival form of the verb. Given that the synthetic form of the past tense has been argued to be less frequent than the synthetic form and to be associated with a higher register (Deuchar, 2006, King, 2015), it was predicted that both groups of children would perform better on the periphrastic compared to the synthetic form of the verb. Additionally, if Welsh-speaking bi-SLI children have problems with tense, they should perform more poorly on both tense forms of the verb compared to their bi-TD peers.

The present study revealed that Welsh-speaking bi-TD children by the age of six years are almost at ceiling in their production of the compound verb forms of the past. They were also able to produce the synthetic past form despite the fact that it is a less frequent form. Conversely, children with SLI exhibited problems with tense morphology to a varying degree across the two tense tasks. In the elicited production task targeting the periphrastic form, the two groups differed both in terms of overall accuracy and proportion of errors. However, the periphrastic form of the past tense

was not as problematic as reported in other languages (e.g. English). The bi-SLI children in our study did not produce more uninflected verbs, that is VSO errors, or omitted more auxiliaries in this task, as the production of SVO structures would suggest. The lack of pronounced problems with auxiliaries may be linked to the properties of Welsh auxiliaries, which differ from the properties of English auxiliaries (Borsley et al., 2007, Davies, 2016, Davies and Deuchar, 2014). Among other things, Welsh auxiliaries are obligatory for the formation of periphrastic tenses, both past and present, remain syllabic forms even when reduced, and are less likely to be omitted in the context of third singular forms examined in the present study (Davies and Deuchar, 2014).⁴ This contrasts with the contracted auxiliary forms in English. We return to this issue when we discuss the various theoretical accounts in the following section.

The task that revealed the greatest differences between the two groups *in terms of tense production* was the sentence completion task, which targeted the production of the low frequency synthetic form of the verb. In this task, the bi-SLI children were not facilitated by the presence of the inflected synthetic verb in the lead-in sentence in contrast to their bi-TD peers. Both groups produced uninflected lexical verbs in VSO contexts with the children with SLI producing more SVO errors as well. These results confirm previous findings in the literature that children with SLI are less likely to be prompted in the context of a low frequency, more complex structure (Garraffa et al., 2015).

⁴ Auxiliary deletion is possible in Welsh (Borsley et al., 2007). However, this is primarily found in second person singular contexts and is more prominent in Southern Welsh than in Northern Welsh dialects (Davies, 2016). An additional difference between Welsh and English auxiliaries is that the Welsh periphrastic past tense can be formed with the verb *gwneud* ‘to do’, which in some analyses has been argued to be more than just an auxiliary and have properties of lexical verbs (Borsley et al., 2007).

Plural formation in Welsh-speaking children

The plural task showed that both groups were still in the process of acquiring the plural formation patterns in Welsh at the age of six years, confirming previous findings on the protracted acquisition rate of the Welsh plural system (Thomas et al., 2013). This study further revealed that the acquisition of the Welsh plural system is particularly problematic for children with SLI, who differed significantly from their TD peers. This is on a par with the findings in languages with equally complex plural systems (Arabic or Hebrew) (Abdalla et al., 2013), but differs from the studies in Icelandic (Thordadottir, 2008) and Hungarian (Lukács et al., 2010), where Mo-SLI children were reported to have less pronounced problems with plural morphology, if at all (Thordadottir, 2016). The differences may be due to various reasons. In the studies by Thordadottir (2008, 2016), the language impaired children did not differ from their TD peers in a naturalistic, conversational setting, but when the task demands were increased, differences emerged. In our study, we elicited plural formation through strict experimental tasks and this may have given rise to the more pronounced problems in our population. Furthermore, our participants were acquiring Welsh under a minority bilingual setting, and this affected the acquisition of plural morphology not only in the language impaired children but also in their TD peers. In contrast, these structures are early acquired in Hungarian and Icelandic by TD monolingual children.

In the present study, we did not find a differential acquisition pattern across the five different plural formation contexts as previously reported with older Welsh-English bilingual children (Thomas et al., 2013). The lack of this effect in the present study may be related to the much younger age of the children in our sample, who are in the process of discovering the various plural formation rules of Welsh. In the

present study, we also balanced the number of items across conditions, and hence, this may have given rise to the difference in the children's performance between the two studies.

Apart from accuracy, the two groups produced different error types. The bi-TD children not only overregularised more than their bi-SLI counterparts, but they also were more creative in their selection of plural suffixes. Conversely, the Bi-SLI children primarily produced singular nouns when not producing the target plural noun and opted for the most frequent suffix when they overregularised.

Theoretical accounts of SLI

The results of the present study shed new light on theoretical accounts of language impairment. According to the EOI account (Rice & Wexler, 2001), children with SLI are expected to have problems with tense morphology due to a maturational constraint that prevents them from producing tense morphemes in obligatory contexts. Conversely, performance on plural formation is expected to be less problematic. The results of the present study do not confirm the predictions of this account. The bi-SLI children in our study had problems with the synthetic form of the past tense but their difficulty with the periphrastic was less pronounced. This was evidenced not only in their higher accuracy with this form, but also in the fewer auxiliary omissions they made compared to that reported for English-speaking children (Rice & Wexler, 2001). The less affected nature of auxiliaries in Welsh SLI may reflect properties of Welsh auxiliaries and their obligatoriness in the formation of tenses (present and past) and their resistance to being dropped in third person singular contexts. It is also consistent with previous findings in the literature regarding crosslinguistic differences in the

severity of impairment, which reflect language-specific properties of auxiliaries (see Bol & de Jong, 1992 for similar arguments for auxiliaries in Dutch).

Turning to the SA (Leonard, 2014b), children with SLI were expected to perform poorly on auxiliaries because they are non-final weak forms, whereas no problems were expected in the case of the synthetic past or with plurals, which involve word-final syllabic suffixes. At the same time, the SA predicted that semantic transparency could override phonetic salience, in that the plural morphemes with a unique semantic function, such as the plural suffix *-iau*, are expected to have higher accuracy than the suffixes that denote other semantic functions as well, such as the *-oedd* suffix in Welsh, which was found to have lower productivity rates than the *-iau* suffix. The results of the present study only partly confirm the SA in that the bi-SLI children overregularised the most frequent and semantically transparent plural suffix (*-iau*). However, contrary to the predictions of the SA, they did not have pronounced problems with auxiliaries, whereas producing lexical verbs and nouns with word-final syllabic suffixes was most challenging.

Usage-based accounts of language impairment in monolingual and bilingual children (Blom and Paradis, 2013, Marchman et al., 1999, Marchman et al., 1997) would predict that children with SLI would be more adversely affected by schema and type frequency compared to their TD peers. In the present study, this would manifest itself as low accuracy on the synthetic form of the past tense, because the synthetic past tense schema is of low frequency in Welsh, as well as low accuracy on the different plural formation patterns apart from the +suffix schema. Additionally, this account would predict that children with SLI would overregularise less than their TD peers and when they did, they would opt for the suffix with the highest type frequency. The results from the present study are mostly in line with the predictions

of this account. The bi-SLI children in the present study exhibited schema and type frequency effects. They were less facilitated by the presence of a prompt in the context of a low frequency structure (synthetic past) compared with their bi-TD peers and they opted for the most frequent suffix when they overregularised in plural contexts (-*iau*). Furthermore, they overregularised less than their bi-TD peers and were severely affected by the complexity of the schema formation pattern, as their markedly depressed performance on the plural indicated. These results point towards productivity problems in Welsh-speaking children with SLI, who were less likely to produce concatenating forms than their TD peers either in target-like or erroneous (overregularisation) contexts (Blom & Paradis, 2013; Marchman et al, 1999).

Clinical implications for Welsh

Apart from their theoretical value, the results of the present study carry important clinical implications and have the potential to inform clinical practice in Wales. By being the first study to systematically examine both tense and plural formation in Welsh-speaking children with SLI, it crucially increases our knowledge regarding the timing and the acquisition pattern of these structures in TD and SLI children. It confirmed that nominal plural formation is late acquired in Welsh-speaking children (Thomas et al., 2013) and that the periphrastic use of the past tense with auxiliaries is acquired early (Borsely & Jones, 2001) in TD children. At the same time, it demonstrated that for 4-to-6-year-old Welsh-speaking TD children the synthetic past is part of their grammatical repertoire and that they can produce it, when appropriately prompted.

In the present study, we also went beyond group differences to investigate whether grammatical morphology can serve as a reliable area of difficulty for Welsh-

speaking children, given that its role has been contested in other studies (Thordardottir, 2016). Therefore, group differences on the three morphemes were further explored through the examination of the diagnostic validity of the three tasks using three different diagnostic measures: ROC curve analysis, sensitivity and specificity and likelihood ratios. These analyses revealed that not all grammatical morphemes serve as good diagnostic measures (Thordardottir, 2016). In the present study, this was demonstrated by the poor diagnostic accuracy of the periphrastic past and the elicited production task that targeted this form. When the combined diagnostic validity of the three tasks was considered, the exclusion of the elicited production task did not have any negative impact on the diagnostic potential of the two other morphological tasks, and the combination of the two tasks tapping into concatenating morphology, namely the synthetic past tense and the plural formation task, increased their potential of correctly classifying children with typical language development, as the specificity values and the likelihood ratios showed.

Furthermore, the present study emphasised the diagnostic potential of error types and rates along with accuracy, when examining typical and atypical children's language profiles. This was particularly evidenced in the case of plural formation, where children with SLI predominantly produced uninflected nouns. This result confirmed previous studies that children's with SLI problems with productive morphology can have a diagnostic potential (Christensen and Hansson, 2012, Boerma et al., 2017).

Finally, the present study highlighted the impact that a task can have on understanding the nature of children's grammar and potentially of the disorder. In our study, the bi-SLI children failed to be facilitated by the presence of a prompt in the sentence completion task, which targeted the concatenating form of the past tense. We

believe that this was due to two reasons. First, the children were prompted to produce a sentence with an inflected lexical verb in a sentence-initial position, as opposed to an inflected auxiliary (that carries a suppletive form) with a bare lexical verb; if this productive rule is not part of the child's grammatical repertoire, they might resort to VSO or SVO structures, and this is something that the bi-SLI children in the study did. Second, the nature of the sentences used in the task, that is a transitive sentence with two arguments, may have influenced their ability to produce fully-fledged sentences. Within the context of dynamic assessment, intervention and treatment, studies have shown that, compared with their TD peers, children with SLI are less likely to benefit from a graduated prompting approach, when it involves a complex structure that is not yet part of their grammatical abilities (Gutieérrez-Clellen and Peña, 2001).

Limitations and Conclusions

This was the first study to examine the acquisition of Welsh past tense and nominal plural morphology in four-to-six-year-old Welsh-English bilingual children with or at risk and without language impairment using novel experimental tasks. In the present study, we found that Welsh-speaking children with SLI had productivity problems, which emerged as depressed accuracy with low frequency forms and limited overregularisation errors. At the same time, they highlighted language impaired children's inability to be facilitated by the presence of a prompt, which may affect how dynamic assessment [and treatment](#) strategies are used with this clinical population.

[This first study to focus on Welsh-speaking children with SLI](#) came with certain limitations. First, the sample size was relatively small. Future studies would

benefit from increasing the number of children within this age range but also from examining older Welsh-speaking children with language impairment and perhaps, with different degrees of exposure to Welsh. In the present study, we found that the differences between the TD children and the children with SLI became more pronounced as the two groups became older; children's with SLI development stagnated at the time when the development of a structure in TD children increased. This is in line with other studies that have argued that the discriminatory accuracy of grammatical morphemes can change as both a function of age and language exposure (Boerma et al., 2017; Thordardottir, 2016).

In the present study, we adopted specific experimental paradigms for the investigation of the production of grammatical morphemes. Given that the production accuracy of TD children and children with SLI has been shown to increase in a naturalistic in comparison to an experimental task (Krok and Leonard, 2015, Thordardottir, 2008), future studies will benefit from investigating how naturalistic and experimental data relate to each other in this population, and what the diagnostic and intervention potential of different methods is.

Despite these limitations, we believe that its increased linguistic sensitivity provides the way towards a better understanding of how Welsh develops in both typically developing and language impaired children and towards offering greater assessment and intervention potential for SLTs working through the medium of Welsh.

References

- ABDALLA, F., ALJENAIE, K. & MAHFOUDHI, A. 2013. Plural noun inflection in Kuwaiti Arabic-speaking children with and without Specific Language Impairment. *Journal of Child Language*, 40, 139-168.
- ARMON-LOTEM, S. & MEIR, N. 2016. Diagnostic accuracy of repetition tasks for the identification of specific language impairment (SLI) in bilingual children: evidence from Russian and Hebrew. *International Journal of Language and Communication Disorders*.
- BALL, M. J. & THOMAS, E. M. 2012. LLARSP- A Grammatical profile for Welsh. In: J.BALL, CRYSTAL, D. & FLETCHER, P. (eds.) *Assessing Grammar – The Language of LARSP*. Bristol: Multilingual Matters.
- BISHOP, D., SNOWLING, M., THOMPSON, P., GREENHALGH, T., CONSORTIUM, C. & CONSORTIUM, C. 2016. CATALISE: A Multinational and Multidisciplinary Delphi Consensus Study. Identifying Language Impairments in Children. *Plos One*, 11.
- BISHOP, D., SNOWLING, M., THOMPSON, P., GREENHALGH, T., CONSORTIUM, C.-. & CONSORTIUM, C.-. 2017. Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development: Terminology. *Journal of Child Psychology and Psychiatry*, 58, 1068-1080.
- BLOM, E. & PARADIS, J. 2013. Past tense production by English second language learners with and without language impairment. *Journal of Speech, Language and Hearing Research*, 56, 281-94.

- BOERMA, T., WIJNEN, F., LESEMAN, P. & BLOM, E. 2017. Grammatical Morphology in Monolingual and Bilingual Children With and Without Language Impairment: The Case of Dutch Plurals and Past Participles. *Journal of Speech, Language, and Hearing Research*, 60, 2064-2080.
- BOL, G. W. & DE JONG, J. 1992. Auxiliary verbs in Dutch SLI children. *Scandinavian Journal of Logopedics and Phoniatrics*, 17, 17-21.
- BORSLEY, R. D. & JONES, B. M. 2001. The development of finiteness in Early Welsh. *Journal of Celtic Language Learning*, 6, 9-20.
- BORSLEY, R. D., TALLERMAN, M. & WILLIS, D. 2007. *The Syntax of Welsh*, Cambridge, Cambridge University Press.
- BORTOLINI, U., ARFÉ, B., CASELLI, C. M., DEGASPERI, L., DEEVY, P. & LEONARD, L. B. 2006a. Clinical markers for specific language impairment in Italian: The contribution of clitics and non-word repetition. *Int J Lang Commun Disord*, 41, 695-712.
- BORTOLINI, U., ARFÉ, B., CASELLI, M., DEGASPERI, L., DEEVY, P. & LEONARD, L. 2006b. Clinical markers for specific language impairment in Italian: the contribution of clitics and non-word repetition. *International Journal of Language & Communication Disorders*, 41, 695-712.
- BYBEE, J. 2009. *Language, Usage and Cognition*, Cambridge University Press (CUP).
- CHONDROGIANNI, V., DAVIES, P. & THOMAS, E. 2013. A new sentence repetition task for Welsh-speaking school aged children. Bangor: Bangor University.

- CHRISTENSEN, R. & HANSSON, K. 2012. The Use and Productivity of Past Tense Morphology in Specific Language Impairment: An Examination of Danish. *Journal of Speech Language and Hearing Research*, 55, 1671-1689.
- CLAHSEN, H., BARTKE, S. & GOLLNER, S. 1997. Formal features in impaired grammars: A comparison of English and German SLI children. *Journal of Neurolinguistics*, 10, 151-171.
- DAVIES, P. 2016. Age Variation and Language Change in Welsh: Auxiliary Deletion and Possessive Constructions. In: DURHAM, M. & MORRIS, J. (eds.) *Sociolinguistics in Wales*. London: Palgrave Macmillan UK.
- DAVIES, P. & DEUCHAR, M. 2014. Auxiliary deletion in the informal speech of Welsh–English bilinguals: A change in progress. *Lingua*, 143, 224-241.
- DE JONG, J., BLOM, E. & ORGASSA, A. 2013. Dummy auxiliaries in children with SLI – a study on Dutch, in monolinguals and bilinguals. In: BLOM, E., VAN DE CRAATS, I. & VERHAGEN, J. (eds.) *Dummy Auxiliaries in First and Second Language Acquisition*. Berlin: DEGRUYTER.
- DEEKS, J. J. & ALTMAN, D. G. 2004. Diagnostic tests 4: likelihood ratios. *BMJ*, 329, 168-169.
- DEUCHAR, M. 2006. Welsh-English code-switching and the matrix language frame model. *Lingua*, 116, 1986-2011.
- DUNN, L. M., DUNN, D. M., STYLES, B. & SEWELL, J. 2009. *The British Picture Vocabulary Scale III*, London, GL Assessment.
- GARRAFFA, M., COCO, M. I. & BRANIGAN, H. P. 2015. Effects of Immediate and Cumulative Syntactic Experience in Language Impairment: Evidence from

- Priming of Subject Relatives in Children with SLI. *Language Learning and Development*, 11, 18-40.
- GATHERCOLE, S. E., C., W., BADDELEY, A. D. & EMSLIE, H. 1994. The Children's Test of Nonword Repetition: a test of phonological working memory.
- GUTIEÉRREZ-CLELLEN, V. F. & PENÑA, E. 2001. Dynamic Assessment of Diverse ChildrenA Tutorial. *Language, Speech, and Hearing Services in Schools*, 32, 212-224.
- HAKANSSON, G., SALAMEH, E. & NETTELBLADT, U. 2003. Measuring language development in bilingual children: Swedish-Arabic children with and without language impairment. *Linguistics*, 41, 255-288.
- KAUSCHKE, C., KURTH, A. & DOMAHS, U. 2011. Acquisition of German Noun Plurals in Typically Developing Children and Children with Specific Language Impairment. *Child Development Research*, 2011.
- KING, G. 2015. *Modern Welsh: a comprehensive grammar*, Routledge.
- KROK, W. C. & LEONARD, L. B. 2015. Past Tense Production in Children With and Without Specific Language Impairment Across Germanic Languages: A Meta-Analysis. *J Speech Lang Hear Res*, 58, 1326-40.
- LEONARD, L. 2014. *Children with Specific Language Impairment*, Cambridge, MA, MIT Press.
- LEONARD, L. B. 1995. Functional categories in the grammars of children with specific language impairment. *J Speech Hear Res*, 38, 1270-83.
- LEONARD, L. B. 2007. Processing limitations and the grammatical profile of children with specific language impairment. *Adv Child Dev Behav*, 35, 139-71.

- LEONARD, L. B., ELLIS WEISMER, S., MILLER, C. A., FRANCIS, D. J., TOMBLIN, J. B. & KAIL, R. V. 2007. Speed of processing, working memory, and language impairment in children. *J Speech Lang Hear Res*, 50, 408-28.
- LUKACS, A., KAS, B. & LEONARD, L. 2013. Case marking in Hungarian children with specific language impairment. *First Language*, 33, 331-353.
- MARCHMAN, V., PLUNKETT, K. & GOODMAN, J. 1997. Overregularization in English plural and past tense inflectional morphology: a response to Marcus (1995). *Journal of Child Language*, 24, 767-779.
- MARCHMAN, V., SACCUMAN, C. & WULFECK, B. 2004. Productive use of the English past tense in children with focal brain injury and specific language impairment. *Brain and Language*, 88, 202-214.
- MARCHMAN, V., WULFECK, B. & WEISMER, S. 1999. Morphological productivity in children with normal language and SLI: A study of the English past tense. *Journal of Speech Language and Hearing Research*, 42, 206-219.
- MARINIS, T. & ARMON-LOTEM, S. 2015. Sentence repetition. In: ARMON-LOTEM, S., DE JONG, J. & MEIR, N. (eds.) *Assessing multilingual children: Disentangling bilingualism from language impairment*. London: Multilingual matters.
- MARSHALL, C. R. & VAN DER LELY, H. K. J. 2007. The impact of phonological complexity on past tense inflection in children with Grammatical-SLI. *Advances in Speech Language Pathology*, 9, 191-203.

- MONTGOMERY, J. W. & LEONARD, L. B. 1998. Real-time inflectional processing by children with specific language impairment: effects of phonetic substance. *Journal of Speech, Language and Hearing Research* 41, 1432-43.
- OETTING, J. B. & RICE, M. L. 1993. Plural acquisition in children with specific language impairment. *Journal of Speech and Hearing Research* 36, 1236-48.
- ORGASSA, A. & WEERMAN, F. 2008. Dutch gender in specific language impairment and second language acquisition. *Second Language Research*, 24, 333-364.
- PARADIS, J. 2010. The interface between bilingual development and specific language impairment. *Applied Psycholinguistics*, 31, 227-252.
- PARADIS, J. 2016. The Development of English as a Second Language With and Without Specific Language Impairment: Clinical Implications. *Journal of Speech, Language and Hearing Research* 59, 171-82.
- PARADIS, J. & CRAGO, M. 2001. The Morphosyntax of Specific Language Impairment in French: An Extended Optional Default Account. *Language Acquisition*, 9, 269-300.
- PINE, J., CONTI-RAMSDEN, G., JOSEPH, K., LIEVEN, E. & SERRATRICE, L. 2008. Tense over time: testing the Agreement/Tense Omission Model as an account of the pattern of tense-marking provision in early child English. *Journal of Child Language*, 35, 55-75.
- PLANTE, E. & VANCE, R. 1994. Diagnostic accuracy of two tests of preschool language. *American Journal of Speech-Language Pathology*, 4, 70-76.
- RAVEN, J. C. 2003. *Raven's Coloured Progressive Matrices™ (CPM)*, London, Pearson Assessment.

- RAVID, D. & SCHIFF, R. 2009. Morphophonological categories of noun plurals in Hebrew: a developmental study. *Linguistics*, 47, 45-63.
- REES, O. & TRYTHALL, M. 1995. *Cwllwm Welsh Phonetic Screening Assessment* Bodmin, STASS Publications.
- RICE, M. L. & WEXLER, K. 1996. Toward tense as a clinical marker of specific language impairment in English-speaking children. *Journal of Speech and Hearing Research*, 39, 1239-57.
- RICE, M. L., WEXLER, K. & HERSHBERGER, S. 1998. Tense over time: the longitudinal course of tense acquisition in children with specific language impairment. *Journal of Speech, Language and Hearing Research*, 41, 1412-31.
- RISPENS, J. & DE BREE, E. 2014. Past tense productivity in Dutch children with and without SLI: the role of morphophonology and frequency. *Journal of Child Language*, 41, 200-225.
- SCHIFF, R., RAVID, D. & LEVY-SHIMON, S. 2011. Children's command of plural and possessive marking on Hebrew nouns: a comparison of obligatory versus optional inflections. *Journal of Child Language*, 38, 433-454.
- SCHÖLER, H. & KÜRSTEN, F. 1995. Specific language impairment: Theoretical approaches and some empirical facts. In: KOVACEVIC, M. (ed.) *Language and language communication barriers: Research and theoretical perspectives in three European languages*. Zagreb: Hrvatska Sveučilišna Naklada.
- SEMEL, E., WIIG, E. H. & SECOND, W. A. 2004. *Clinical Evaluation of Language Fundamentals®-Preschool-2*, London, Pearson assessment.

- THOMAS, E. M. N., WILLIAMS, N. I. A., JONES, L. A., DAVIES, S. & BINKS, H. 2013. Acquiring complex structures under minority language conditions: Bilingual acquisition of plural morphology in Welsh. *Bilingualism*, 17, 478-494.
- THORDARDOTTIR, E. 2008. Language-specific effects of task demands on the manifestation of specific language impairment: A comparison of English and Icelandic. *Journal of Speech Language and Hearing Research*, 51, 922-937.
- THORDARDOTTIR, E. 2015. The relationship between bilingual exposure and morphosyntactic development. *International Journal of Speech-Language Pathology*, 17, 97-114.
- THORDARDOTTIR, E. 2016. Grammatical morphology is not a sensitive marker of language impairment in Icelandic in children aged 4-14 years. *Journal of Communication Disorders*, 62, 82-100.
- THORDARDOTTIR, E., KEHAYIA, E., MAZER, B., LESSARD, N., MAJNEMER, A., SUTTON, A., TRUDEAU, N. & CHILINGARYAN, G. 2011. Sensitivity and Specificity of French Language and Processing Measures for the Identification of Primary Language Impairment at Age 5. *Journal of Speech Language and Hearing Research*, 54, 580-597.
- TULLER, L. 2015. Clinical use of parental questionnaires in multilingual contexts. In: ARMON-LOTEM, S., DE JONG, J. & MEIR, N. (eds.) *Assessing multilingual children: Disentangling bilingualism from language impairment*. London: Multilingual matters.
- WEXLER, K. 1998. Very early parameter setting and the unique checking constraint: A new explanation of the optional infinitive stage. *Lingua*, 106, 23-79.

